

JAPAN

EDICT OF GOVERNMENT

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JIS B 9960-31 (2004) (English): Safety of
machinery -- Electrical equipment of machines --
Part 31: Particular safety and EMC requirements
for sewing machines, units and systems

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*The citizens of a nation must
honor the laws of the land.*

Fukuzawa Yukichi

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INDUSTRIAL
STANDARD

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Japanese Standards Association

JIS B 9960-31 : 2004

(IEC 60204-31 : 2001)

(JMF)

**Safety of machinery —
Electrical equipment of machines —
Part 31: Particular safety and EMC
requirements for sewing machines,
units and systems**

ICS 13.110; 61.080

Reference number : JIS B 9960-31 : 2004 (E)

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Foreword

This translation has been made based on the original Japanese Industrial Standard established by the Minister of Health, Labour and Welfare, and the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee according to the proposal of establishing a Japanese Industrial Standard from the Japan Machinery Federation (JMF) with a draft of Industrial Standard based on the provision of Article 12 Clause 1 of Industrial Standardization Law.

This Standard has been made based on IEC 60204-31:2001, *Safety of machinery – Electrical equipment of machines – Part 31: Particular safety and EMC requirements for sewing machines, units and systems* for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Ministers and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

JIS B 9960 consists of the following 4 parts under the general title *Safety of machinery – Electrical equipment of machines*:

Part 1 : General requirements

Part 11: Requirements for HV equipment for voltages above 1 000 V a.c. or 1 500 V d.c. and not exceeding 36 kV

Part 31: Particular safety and EMC requirements for sewing machines, units and systems

Part 32: Requirements for hoisting machines.

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the original JIS is to be the final authority.

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**Safety of machinery —
Electrical equipment of machines —
Part 31: Particular safety and EMC requirements for
sewing machines, units and systems**

Introduction This Japanese Industrial Standard has been prepared based on the third edition of IEC 60204-31, *Safety of machinery—Electrical equipment of machines—Part 31: particular safety and EMC requirements for sewing machines, unit and systems* published in 2001 without modifying the technical contents.

Portions given sidelines or dotted underlines are the matters not stated in the original International Standard.

This Standard is intended to be used in conjunction with IEC 60204-1: *Safety of machinery—Electrical equipment of machines—Part 1: General requirements* (Edition 3, 1992).

This Standard supplements or modifies the corresponding clauses in IEC 60204-1 so as to specify requirements for the electrical equipment of sewing machines, units and systems.

Annexes which are additional to those in IEC 60204-1:1992 are lettered AA and BB.

Information 1 IEC 60204-1 (Edition 4) was published in 1997, and the corresponding JIS B 9960-1 has come into effect in 1999. But the original International Standard of this Standard IEC 60204-31, refers IEC 60204-1:1992 edition, not that 1997 edition. JIS identical with IEC 60204-1:1992 does not exist, therefore, this Standard specifies supplements to or modifications from IEC 60204-1:1992, but not JIS B 9960-1.

Since difference between IEC 60204-1:1992 and IEC 60204-1:1997 is small, it is possible to understand outlines of this Standard by referring JIS B 9960-1. Annex 1 (informative) shows comparison between IEC 60204-1:1992 and IEC 60204-1:1997 (JIS B 9960-1).

- 2 The original International Standard of this Standard, IEC 60204-31:1992 is practically the same as EN 60204-31:1998, which conforms to this Standard.
- 3 Annex AA (normative) specifies concrete requirements of EMC and constitutes part of provisions. Annex BB (informative) gives information only. Annex 1 (informative) is the matters not stated in the original International Standard.

1 Scope This part of JIS B 9960 applies to the application of electrical and electronic equipment to sewing machines, units and systems, designed specifically for professional use in the sewing industry.

The equipment covered by this part of JIS B 9960 commences at the point of connection of the supply to the electrical equipment of the machine (see 5.1). This part of JIS B 9960 is applicable to the electrical equipment or parts of the electrical equipment which operate with nominal supply voltages not exceeding 1 000 V for alternating current and not exceeding 1 500 V for direct current, and with nominal frequencies not exceeding 200 Hz.

It does not cover all the requirements (e.g. guarding, interlocking, control) that are necessary to safeguard persons from hazards other than electrical hazards and which are specified in other standards.

This part applies to sewing units and systems which are installed in dry and well-kept clean locations and which process dry sewing material, as in the clothing industry. Where sewing units and systems are used in other than dry and well-kept clean locations, more stringent measures may be necessary, which need to be agreed.

Note 1 See IEC 60335-2-28 (JIS C 9335-2-28) for requirements for sewing machines for household and similar use.

2 The International Standard corresponding to this Standard is as follows.

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and JIS are IDT (identical), MOD (modified), and NEQ (not equivalent) according to ISO/IEC Guide 21.

IEC 60204-31:2001, *Safety of machinery—Electrical equipment of machines—Part 31: Particular safety and EMC requirements for sewing machines, unit and systems* (IDT)

2 Normative references The following standards contain provisions which, through reference in this Standard, constitute provisions of this Standard. If the indication of the year of coming into effect or the year of publication is given to these referred standards, only the edition of the indicated year constitutes the provision of this Standard but the revision and amendment made thereafter do not apply.

JIS C 0364-4-41:1997 *Electrical installations of buildings Part 4: Protection for safety Chapter 41: Protection against electric shock*

Note : IEC 60364-41:1992, *Electrical installation of buildings—Part 4: Protection for safety—Chapter 41: Protection against electric shock* is identical with the said standard.

JIS C 0704:1995 *Insulation test for control gear*

Note : IEC 60664-1:1992, *Insulation coordination for equipment within low-voltage systems—Part 1: Principles, requirements and tests* is equivalent

to the said standard.

JIS C 0920:1993 *Tests to prove protection against ingress of water and degrees of protection against ingress of solid objects for electrical equipment*

Note : IEC 60592:1989, *Degrees of protection provided by enclosures (IP code)* is identical with the said standard.

JIS C 4203:1983 *Single phase induction motors for general purpose*

Note : IEC 60072-1:1991, *Dimension and output series of rotating electrical machines—Part 1: Frame numbers 56 to 400 and flange numbers 55 to 1 080* is equivalent to the said standard.

JIS C 4210:1983 *Low-voltage three-phase squirrel-cage induction motors for general purpose*

Note : IEC 60072-2:1991, *Dimension and output series of rotating electrical machines—Part 2: Frame numbers 355 to 1 000 and flange numbers 1 180 to 2 360* is equivalent to the said standard.

JIS C 4526-1:1999 *Switches for appliances—Part 1: General requirements*

Note : IEC 61058-1:1996, *Switches for appliances—Part 1: General requirements* is equivalent to the said standard.

JIS C 8201-3:2001 *Low-voltage switchgear and controlgear—Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units*

Note : IEC 60947-3:1990, *Low voltage switchgear and controlgear—Part 3: Switches, disconnectors and fuse-combination units* is equivalent to the said standard.

JIS C 8201-4-1:1999 *Low-voltage switchgear and controlgear—Part 4: Contactors and motor-starters Section 1: Electromechanical contactors and motor-starters*

Note : IEC 60947-4-1:1990, *Low voltage switchgear and controlgear—Part 4: Contactors and motor-starters—Section One: Electrotechnical contactors and motor-starters* is equivalent to the said standard

JIS C 9742:2000 *Isolating transformers and safety isolating transformers—Requirements* is equivalent to the said standard.

Note : IEC 60742:1983 *Isolating transformers and safety isolating transformers. Requirements* is equivalent to the said standard

JIS C 60721-3-3:1997 *Classification of environmental conditions Part 3: Classification of groups of environmental parameters and their severities Section 3: Stationary use at weatherprotected locations*

Note : IEC 60721-3-3, *Classification of environmental conditions—Part 3: Classification of groups of environmental parameters and their severities—Section 3: Stationary use at weather-protected locations* is identical with the said standard.

JIS C 61000-4-2:1999 *Electromagnetic compatibility (EMC)—Part 4: Testing and*

measurement techniques—Section 2: Electrostatic discharge immunity test

Note : IEC 61000-4-2:1995 *Electromagnetic compatibility (EMC)—Part 4: Testing and measurement techniques—Section 2: Electrostatic discharge immunity test*. Basic EMC publication is identical with the said standard.

JIS C 61000-4-3:1997 *Electromagnetic compatibility (EMC)—Part 4: Testing and measurement techniques—Section 3: Radiated, radio-frequency, electromagnetic field immunity test*

Note : IEC 61000-4-3:1995, *Electromagnetic compatibility (EMC)—Part 4: Testing and measurement techniques—Section 3: Radiated radio-frequency, electromagnetic immunity test* is identical with the said standard.

JIS C 61000-4-4:1999 *Electromagnetic compatibility (EMC)—Part 4: Testing and measurement techniques—Section 4: Electrical fast transient/burst immunity test*

Note : IEC 61000-4-4:1995, *Electromagnetic compatibility (EMC)—Part 4: Testing and measurement techniques—Section 4: Electrical fast transient/burst immunity test*. Basic EMC Publication is equivalent to the said standard.

JIS C 61000-4-6:1999 *Electromagnetic compatibility (EMC)—Part 4: Testing and measurement techniques—Section 6: Immunity to conducted disturbances, induced by radio-frequency fields*

Note : IEC 61000-4-6:1996, *Electromagnetic compatibility (EMC)—Part 6: Testing and measurement techniques—Section 6: Immunity to conducted disturbances, induced by radio-frequency fields* is equivalent to the said standard.

IEC 60034-1:1997, *Rotating electrical machines—Part 1: Rating and performance*

Note : JIS C 4034-1:1999 *Rotating electrical machines Part 1: Rating and performance* is based on the said standard, but is not equivalent.

IEC 60204-1:1992, *Electrical equipment of industrial machines—Part 1: General requirements*

ISO 4915:1991, *Textiles—Stitch types—Classification and terminology*

ISO 4916:1991, *Textiles—Seam types—Classification and terminology*

CISPR 11:1999, Ed.3.1, *Industrial, scientific and medical (ISM) radio frequency equipment—Electromagnetic disturbance characteristics—Limits and methods of measurement*

ENV 50204:1995 *Radiated electromagnetic field from digital radio telephones—Immunity test*

3 Definitions For the purposes of this Standard, the definitions given in IEC 60204-1:1992 and the following definitions apply.

3.101 sewing machine machine designed to produce one or more stitch type (see ISO 4915) with one or more sewing threads. In producing a seam (see ISO 4916) the machine can perform one or more sewing functions.

Note : Previously, the term “sewing machine head” was used instead of “sewing machine”.

3.102 sewing machine stand item, for example designed as a table, on which the sewing machine is arranged to enable optimum operation.

3.103 sewing machine drive equipment that drives a sewing machine, such as an electric motor, which is speed-controlled by electrical and/or mechanical means with or without a positioning device and with or without control of machine functions.

3.104 sewing unit equipment consisting of at least a sewing machine, a sewing machine stand and a sewing machine drive. One or several devices incorporated in and/or attached to the sewing machine or sewing unit, for example for sewing, cutting, feeding, etc. the sewing material, as well as the sewing machine itself, are controlled by the operator or automatically.

3.105 sewing system equipment consisting of at least two sewing units or parts of them, which are functionally interlinked.

4 General requirements Given in clause 4 of IEC 60204-1:1992 and the following apply.

4.4.1 Electromagnetic compatibility Annex AA shall apply instead of 4.4.1 of IEC 60204-1:1992.

4.4.3 Humidity Given in 4.4.3 of IEC 60204-1:1992, however, instead of the first paragraph, the following applies:

The electrical equipment shall be capable of operating in the intended manner in the humidity conditions covered by class 3K3 as specified in JIS C 60721-3-3.

5 Incoming supply conductor terminations and devices for disconnecting and switching off Given in clause 5 of IEC 60204-1:1992 and the following apply.

Information : The conductor means mainly cables or electric wires. In some cases, it means bare conductors.

5.1 Incoming supply conductor terminations Given is 5.1 of IEC 60204-1:1992 and the following apply.

Add after the first sentence of the first paragraph:

Each sewing unit shall have only one incoming supply connection.

Each sewing system consisting of at least two sewing units may have its own incom-

ing supply connection for each sewing unit; however, if a failure of one sewing unit can cause a hazard, the sewing system shall have only one incoming supply connection.

Further, the first sentence of the third paragraph is replaced by the following:

A neutral conductor may be used.

5.3 Supply disconnecting (isolating) device

5.3.1 General Given in 5.3.1 of IEC 602041-1:1992 and the following apply.

When sewing units are interconnected by means of control systems to form sewing systems, only one supply disconnecting device shall be provided.

5.3.2 Type Given in 5.3.1 of IEC 60204-1:1992 and the following apply.

Addition to items d):

On sewing units and systems which are started and stopped by a actuating a hold-to-run control device (e.g. pedal), an isolating switch according to JIS C 8201-3 for utilization categories AC-3 or DC-3, or a built-in switch according to JIS C 4526-1, shall be used.

5.3.3 Requirements

5.3.3.1 General Given in 5.3.3.1 of IEC 60204-1:1992 and the following apply.

This implies that in the case of 5.3.2 d), the requirements of 5.3.3.1 of IEC 60204-1:1992 do not apply.

5.3.4 Operating handle Given in 5.3.4 of IEC 60204-1:1992 and the following apply.

For seated positions the operating handle of the ON/OFF switch shall be mounted between 0.5 m and 1.5 m above the servicing level.

6 Protection against electric shock Given in clause 6 of IEC 60204-1:1992 and the following apply.

6.1 General Given in 6.1 of IEC 60204-1:1992 and the following apply.

This can also be achieved by the application of SELV according to JIS C 0364-4-41, particularly the last paragraph of 411.1.4.3.

6.4 Protection by the use of PELV (Protective Extra-Low Voltage) Item b) of 6.4 of IEC 60204-1:1992 is not applicable.

7 Protection of equipment Given in clause 7 of IEC 60204-1:1992 and the following apply.

7.5 Protection against supply interruption or voltage reduction and subsequent restoration Given in 7.5 of IEC 60204-1:1992 and the following apply.

On sewing units and systems, which are started by actuating a hold-to-run control device (such as a pedal), and stopped by releasing it, the provision of a device for

avoiding an unintentional restart after a supply interruption or voltage reduction and subsequent restoration is not necessary.

8 Equipotential bonding Given in clause 8 of IEC 60204-1:1992 and following apply.

8.2.5 Parts which need not be connected to the protective bonding circuit Given in 8.2.5 of IEC 60204-1:1992 and the following apply.

It is not necessary to connect sewing machine stands or their accessible conducting parts when:

- they do not carry electrical equipment; or
- they carry electrical equipment operated at SELV and/or PELV only (see JIS C 0364-4-41).

9 Control circuits and control functions Given in clause 9 of IEC 60204-1:1992 and the following apply.

9.1.1 Control circuit supply Instead of 9.11 of IEC 60204-1:1992, the following apply:

Control circuits of sewing units and systems shall meet requirements for PELV (see 6.4) or SELV (see JIS C 0364-4-41). The transformers supplying these circuits shall meet the requirements of JIS C 9742.

9.1.4 Connection of control devices The requirements of 9.1.4 of IEC 60204-1:1992 does not apply to controls of sewing machine drives with positioning devices.

9.2.5.2 Start The requirements of 9.2.5.2 of IEC 60204-1:1992 do not apply to:

- sewing units and systems, which are started by actuating a hold-run control device (such as a pedal);
- sewing units and systems for automatic bar tacking, sewing of buttonholes, fastening of buttons, etc., which have a short sewing cycle.

9.2.5.3 Stop Given in 9.2.5.3 of IEC 60204-1:1992 and the following apply.

The STOP function required for sewing units and systems is met by a hold-to-run control devices (such as a pedal). On sewing units and systems for automatic bar tacking, sewing of buttonholes, fastening of buttons, etc., which have a short sewing cycle, the required function is met by an ON/OFF switch according to JIS C 8201-3 or JIS C 4526-1.

9.4 Control functions in case of failure Given in 9.4 of IEC 60204-1:1992 and the following apply.

9.4.1 General requirements Given in 9.4.1 of IEC 60204-1:1992, and following note is added.

Note : On sewing units and systems on which the hazardous movement of parts is limited to parts of the sewing machine itself, for example stitch forming

elements, feed, etc., in general a single failure cannot give rise to hazardous conditions because the mechanical guards. Therefore, for these machines protective interlocking of the electrical circuit is not necessary.

9.4.2 Measures to minimize risk in case of failure

9.4.2.1 Use of proven circuit techniques and components Given in 9.4.2.1 of IEC 60204-1:1992, however, at the end of the second indent, replace "(see 9.1.4)" by the following:

Note : See 9.1.4 of this Standard.

9.4.2.2 Provision for redundancy Given in 9.4.2.2 of IEC 60204-1:1992, and following note is added.

Note : On sewing units and systems on which the hazardous movement of parts is limited to parts of the sewing machine itself, for example stitch forming elements, feed, etc., provision of redundancy is not necessary.

9.4.2.3 Use of diversity Given in 9.4.2.3 of IEC 60204-1:1992, and following note is added.

Note : On sewing units and systems on which the hazardous movement of parts is limited to parts of the sewing machine itself, for example stitch forming elements, feed, etc., use of diversity is not necessary.

9.4.3.1 Earth faults Given in 9.4.3.1 of IEC 6024-1:1992 and the following apply.

On sewing units and systems, a **particularly safe installation** of those conductors that in the case of an earth fault could cause unintended starting, or hazardous movement of a machine, or could prevent its stopping, may be used instead of connecting the control circuits to the protective bonding circuit or providing an insulation monitoring device.

A **particularly safe installation** can be achieved, for example, by:

- enclosure of insulated conductors in ducts of insulating material;
- use of double insulation techniques; or
- encapsulation of components and devices.

10 Operator interface and machine mounted control devices Given in clause 10 of IEC 60204-1:1992 and the following apply.

10.1.1 Location and mounting Given in 10.1.1 of IEC 60204-1:1992, however, the first dashed indent the second paragraph is replaced by the following:

- those used for normal operation are not less than 0.6 m above the servicing level and are within easy reach from the normal working position of the operator (but see also 5.3.4 of this part);
- those used for adjustment and maintenance are not less than 0.3 m above the servicing level and so installed that they cannot be actuated normal operation for example by position, locking, etc.

10.1.2 Protection Instead of 10.1.2 of IEC 60204-1:1992, the following apply:

Where mounted as intended, operator interface and machine mounted control devices shall withstand the stresses of the expected use and shall a minimum degree of protection of at least IP40 (see JIS C 0920). IP40 is considered to be sufficient when sewing units and sewing systems are operated in an environment in which the effects of aggressive fluids, vapours and contamination by coarse dust and chips are not be expected.

10.2 Push-buttons

10.2.1 Colours Given in 10.2.1 of IEC 60204-1:1992, however, instead of the first sentence, the following applies:

As far as is practicable, push-button actuators shall be colour-coded, in accordance with table 2; limitations of the practicability are sizes of actuators, built-in casing and design of actuators.

10.3 Indicator lights and displays

10.3.2 Colours Given in 10.3.2 of IEC 60204-1:1992, and instead of the first sentence the following applies:

As far as is practicable, indicator light lenses shall be colour-coded, with respect to the condition (status) of the machine in accordance with table 3; limitations of the practicability are sizes of actuators, built-in casing and design of actuators.

10.4 Illuminated push-buttons Given in 10.4 of IEC 60204-1:1992, however, instead of the first sentence, the following applies:

As far as is practicable, illuminated push-buttons shall be colour-coded in accordance with tables 2 and 3; limitations of the practicability are sizes of actuators, built-in casing and design of actuators.

10.7.5 Use of means of disconnection Given in 10.7.5 of IEC 60204-1: 1992 and the following apply.

On automatically controlled sewing units and systems for which emergency stop devices according to 10.7.2 of IEC 60204-1: 1992 are considered to be unnecessary. the supply disconnecting device shall fulfil the function of the emergency stop device (see also 5.3.3.1 of this Standard).

On sewing units and systems which are started by actuating a hold-to-run control device (such as a pedal), an emergency stop device is not required. Moreover, an emergency stop device is not necessary on automatically controlled sewing units and systems for automatic bar tacking, sewing of buttonholes, fastening of buttons, etc., which have only a short automatic sewing process.

These sewing units and systems may be equipped with a device according to JIS C 8201-3 or JIS C 4526-1 for switching ON and OFF.

11 Control interfaces Given in clause 11 of IEC 60204-1: 1992 and the following apply.

11.1 General Given in 11.1 of IEC 60204-1: 1992 and the following apply.

If a risk evaluation does not reveal the existence of a larger injury risk, because, for instance, hazardous parts are protected by mechanical guards, the input or output circuits of sewing units and systems need not be, partly or completely, electrically isolated from internal circuits of the numerical control or from the programmable control unit, and the control voltages need not be earthed.

11.2 Digital input/output interfaces

11.2.2 Outputs The first paragraph of 11.2.2 of IEC 60204-1:1992 is not applicable.

12 Electronic equipment Clause 12 of IEC 60204-1: 1992 is applicable.

13 Controlgear: location, mounting and enclosures Given in clause 13 of IEC 60204-1: 1992 and the following apply.

13.2 Location and mounting

13.2.1 Accessibility and maintenance Given in 13.2.1 of IEC 60204-1:1992, however, instead of the second paragraph, the following applies:

Where access is required for regular maintenance or adjustment, the relevant devices shall be arranged between 0.3 m and 2.0 m above the servicing level.

13.2.2 Segregation Given in 13.2.2 of IEC 60204-1: 1992 and the following apply.

In enclosures according to 6.2.1, the distances between the protective enclosure and live parts shall be not less than the clearance and creepage distances given in column L-L of table C.1 of JIS C 8201-4-1.

For printed circuit assemblies and all other electrical equipment and devices (such as switches, motors), JIS C 0704, table 4, pollution degree 2 shall apply.

13.3 Degrees of protection Instead of 13.3 of IEC 60204-1:1992, the following apply.

The minimum degree of protection shall be IP40 for enclosures of switching devices of sewing units and systems. Exception, if all the circuits used in and with the devices meet the requirements of 6.1 of this part of JIS B 9960, IP20 is permitted as the minimum degree of protection.

14 Conductors and cables Clause 14 of IEC 60204-1: 1992 is applicable.

15 Wiring practices Given in clause 15 of IEC 60204-1: 1992 and the following apply.

15.2.4 Identification of other conductors Given in 15.2.4 of IEC 60204-1: 1992 and the following apply.

Conductors used for functional earthing shall be identified by the colour GREY.

Common conductors, for example for eliminating static charges, shall be identified by the colour GREY.

15.5.8 Terminals, connection and junction boxes Given in 15.5.8 of IEC 60204-1: 1992, however, instead of the second sentence of the first paragraph, the following applies:

IP40 (see JIS C 0920) shall be the minimum degree of protection for connection and through boxes of sewing units and systems. Exception, if all the circuits used in and with the devices meet the requirements of 6.1 of this Standard, IP20 is permitted as the minimum degree of protection.

16 Electric motors and associated equipment Given in clause 16 of IEC 60204-1: 1992 and the following apply.

16.1 General requirements Given in 16.1 of IEC 60204-1: 1992 and the following apply.

Voltage transformation for the purpose of feeding external consumers (loads) by tapping the stator winding of motors is not permitted.

16.2 Motor enclosures Given in 16.2 of IEC 60204-1: 1992 and the following apply.

The minimum degree of protection of the sewing machine drive (including the control device possibly attached to it) shall be IP40.

16.3 Motor dimensions Given in 16.3 of IEC 60204-1: 1992 and the following apply.

The dimensions of sewing machine drives need not correspond to JIS C 4203 and JIS C 4210.

17 Accessories and lighting Given in clause 17 of IEC 60204-1: 1992 and the following apply.

17.2 Local lighting of the machine and equipment

17.2.1 General Given in 17.2.1 of IEC 60204-1: 1992 and the following apply.

For local lighting (sewing lamps) of sewing units and systems up to a rated voltage of 50 V a.c., the ON/OFF switch may be incorporated in the flexible connecting cords.

17.2.2 Supply Given in 17.2.2 of IEC 60204-1: 1992 and the following apply.

Low-voltage sewing lamps shall be supplied either by built-in transformers or by external extra-low voltage transformers according to JIS C 9742.

Circuits for local lighting (sewing lamps) intended for use for, for example threading, replacing sewing implements, maintenance work, shall be connected to the incoming supply side of the device for switching ON and OFF the sewing unit or system.

18 Warning signs and item designations Clause 18 of IEC 60204-1:1992 is applicable.

19 Technical documentation Given in clause 19 of IEC 60204-1:1992 and the following apply.

19.8 Operating manual Given in 19.8 of IEC 60204-1:1992 and the following apply.

The instructions shall draw attention to the need always to switch off the sewing unit or system, for example by actuating the ON/OFF switch or by disconnecting the plug from the incoming supply, when:

- sewing implements (such as sewing machine needle, presser foot, bobbin or needle plate) have to be replaced;
- threading a needle, looper, spreader, etc. is required;
- the workplace is left unattended;
- maintenance work has to be performed.

20 Testing Given in clause 20 of IEC 60204-1:1992 and the following apply.

20.1 General Given in 20.1 of IEC 60204-1:1992 and the following apply.

The tests of 20.2, 20.3, 20.4 and 20.7 are routine tests.

The tests of 20.5 and 20.6 are type tests.

20.3 Insulation resistance tests Given in 20.3 of IEC 60204-1:1992 and the following apply.

Control and signal circuits containing electronic devices shall be connected to the protective conductor while the other circuits are tested. After disconnecting the protective conductor connection mentioned above, the insulation resistance to earth shall be measured in a second test with at least 100 V d.c. The test voltage shall not be applied suddenly in order to avoid any damage to the electronic circuit.

20.4 Voltage tests Given in 20.4 of IEC 60204-1:1992 and the following apply.

Such disconnected components include rectifiers, capacitors, electronic devices and motors up to a rated power of 1 kW.

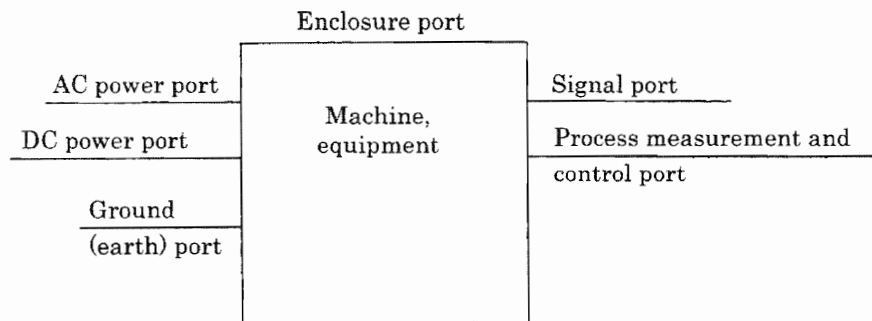
Motors shall be tested according to IEC 60034-1. Electronic circuits of below 50 V rated voltage shall not be subjected to a voltage test.

20.6 Electromagnetic compatibility tests Annex AA.5 shall apply instead of 20.6 of IEC 60204-1:1992.

Annex AA (normative) Electromagnetic compatibility requirements

The objective of this annex is to define limits for sewing units, sewing systems and their equipment, e.g. sewing machine drives, controls, etc., in relation to electromagnetic emissions which may cause interference in other equipment, and in relation to continuous and transient, conducted and radiated disturbances, including electrostatic discharges.

AA.1 Electromagnetic compatibility test levels The ports which can be influenced by electromagnetic phenomena are:



The limits of electromagnetic compatibility specified in tables AA.1 to AA.7 are effective:

- 1) in the case of emission limits, for foreseeable use in a residential environment; and
- 2) in the case of immunity, for use in the industrial environment characteristic of the sewing industry;

and therefore covers foreseeable use in all environments of the sewing industry.

AA.2 Emission The electrical disturbances generated by the machine or by the equipment shall not exceed the levels specified in table AA.1.

Measurement of interference voltages is not required on shielded lines which connect shielded parts of equipment. The shields shall be connected together.

Measurement of the interference voltages is not required on lines connecting parts of equipment which are less than 2 m in length and which cannot be extended.

Information : All the sewing machines units and systems other than domestic use are permitted the emission level shown in table AA.1A (CISPR11 Class A). In this case, the instruction manual shall be

clearly described that they are intended to be used for other than domestic use.

AA.3 Immunity Where electronic equipment is used, it shall be designed to withstand at least the test values specified in tables AA.2 to AA.7.

The immunity test requirements for machines and equipment covered by this part are on a port to port basis.

AA.4 Performance criteria Machines and equipment shall not become hazardous as a result of the application of the tests defined in this part of JIS B 9960.

A functional description and a definition of performance criteria, during or as a consequence of the EMC testing, shall be noted in the test report, based on the following:

- performance criterion A: the machines and equipment shall continue to operate in the intended manner. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the machines and equipment are used as intended. In some cases, the performance level may be replaced by a permissible loss of performance;
- performance criterion B: the machines and equipment shall continue to operate in the intended manner after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the machines and equipment are used as intended. In some cases, the performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed.

If either the minimum performance level or the permissible performance loss is not specified by the supplier, then either of these may be derived from the product description and documentation and what the user may reasonably expect from the machines and equipment when used in the intended manner.

AA.5 Electromagnetic compatibility tests

AA.5.1 General electromagnetic compatibility (EMC) test conditions The EMC tests shall be carried out:

- within the specified operating conditions for sewing units and systems or equipment and its nominal supply voltage;
- on completely equipped and ready-for-use sewing units and systems or, for sewing systems, on the individual machines in working order which build the entirety of the system;
- on sewing units and systems or equipment arranged in their maximum extension

(for example controls with the maximum number of inputs/outputs and functions, all machines and equipment with minor configurations being considered to be in accordance with the standard);

- as single tests in sequence, the sequence of the test being optional.

The configuration and mode of operation during the test shall be precisely noted in the test report.

It is not always possible to test every function of the machine, and in such cases the most critical mode of operation shall be selected.

It may be determined, from consideration of the electrical characteristics and usage of particular machines and equipment, that some of the tests are inappropriate and are therefore unnecessary. In such a case, the decision not to test shall be recorded in the test report.

The sewing machine drive and additional equipment shall be tested on a standard sewing unit equipped as shown in figure AA.1.

The sewing machine drives and equipment thus tested this will be regarded as EMC-prepared. Specific test measures shall be agreed upon with the suppliers involved.

Note : EMC-prepared equipment cannot guarantee solely the EMC-compatibility of the sewing unit or sewing system.

Measurements shall be performed under well-defined and reproducible conditions for each type of EMC phenomenon.

AA.5.2 EMC test conditions for emission The description of the test and the test equipment shall be as given in clauses 7 and 8 of **CISPR 11**.

The test shall be carried out using the test set-up shown in figure AA.1, except that the requirements for the ground plane shall be according to clause 8 of **CISPR 11**.

AA.5.3 EMC test conditions for immunity The description of the test, the test methods and test equipment are given in the standards listed in tables AA.2 to AA.7.

The test shall be carried out using the test set-up shown in figure AA.1.

The test for sewing systems may differ from this test set-up.

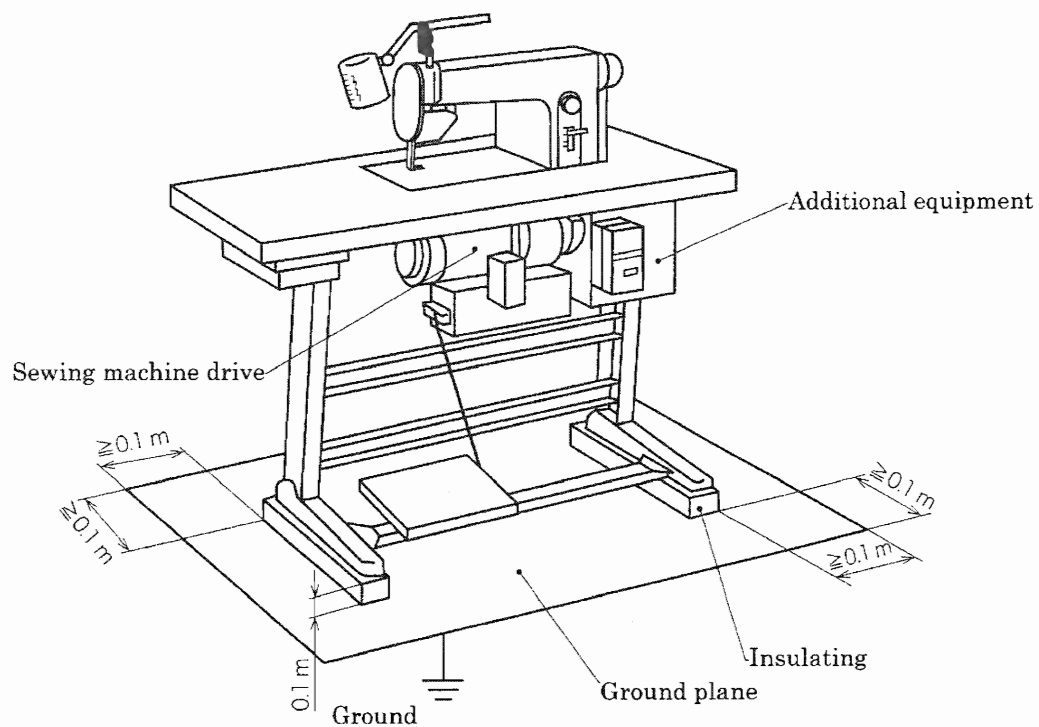


Figure AA.1 Standard sewing unit for EMC tests

Table AA.1 Emission-Radiated (enclosure) and conducted (AC mains)

Port	Frequency range	Limits	Basic standard	Applicability Note
Enclosure	30 MHz— 230 MHz 230 MHz— 1 000 MHz	30 dB (μV/m) quasi-peak, measured at 10 m distance 37 dB (μV/m) quasi-peak, measured at 10 m distance	CISPR 11	See Note 1
AC mains	150 kHz—0.5 MHz	66 dB (μV) to 56 dB (μV) quasi-peak 56 dB (μV) to 46 dB (μV) average, decreasing linearly with the logarithm of the frequency		See Notes 2, 3 and 4
	0.5 MHz—5 MHz	56 dB (μV) quasi-peak 46 dB (μV) average		See Notes 2, 3 and 4
	5 MHz—30 MHz	60 dB (μV) quasi-peak 50 dB (μV) average		See Notes 2, 3 and 4
Notes 1 In situ measurements are excluded from this standard.				
2 Impulse noise (clicks) which occurs less than five times per minute is not considered. For clicks appearing more often than 30 times per minute, the limits of table AA.1 apply. For clicks appearing between five and 30 times per minute, a relaxation of 20 log 30/N dB of the limits of table AA.1 is allowed (where N is the number of clicks per minute).				
3 Applies only to machine and equipment operating at less than 1 000 V r.m.s.				
4 These values are part of CISPR 11.				

Table AA.1A (Information) Emission-Radiated (enclosure) and conducted (AC mains)

Port	Frequency range	Limits	Basic standard	Applicability Note
Enclosure	30 MHz— 230 MHz 230 MHz— 1 000 MHz	30 dB (μV/m) quasi-peak, measured at 30 m distance 37 dB (μV/m) quasi-peak, measured at 30 m distance	CISPR 11	See Notes 1 and 2
AC mains	150 kHz— 0.5 MHz	79 dB (μV) quasi-peak 66 dB (μV) average		See Notes 3, 4 and 5
	0.5 MHz— 5 MHz	73 dB (μV) quasi-peak 60 dB (μV) average		See Notes 3, 4 and 5
	5 MHz— 30 MHz	73 dB (μV) quasi-peak 60 dB (μV) average		See Notes 3, 4 and 5
Notes 1 In situ measurements are excluded from this standard. 2 Measurement by the 3 m or 10 m method (measured at 3 m or 10 m distance) may be applied. 3 Impulse noise (clicks) which occurs less than five times per minute is not considered. For clicks appearing more often than 30 times per minute, the limits of table AA.1 apply. For clicks appearing between five and 30 times per minute, a relaxation of 20 log 30/N dB of the limits of table AA.1 is allowed (where N is the number of clicks per minute). 4 Applies only to machine and equipment operating at less than 1 000 V r.m.s. 5 These values are part of CISPR 11.				

Table AA.2 Immunity – Enclosure port

Environmental phenomena	Test specification	Units	Basic standard	Test set-up	Remarks	Performance criteria
Radio-frequency electromagnetic field, amplitude modulated	80 – 1 000 10 80	MHz V/m (unmodulated, r.m.s) % AM (1 kHz)	JIS C 61000-4-3	JIS C 61000-4-3	See Note. The test level specified is prior to modulation	A
Radio-frequency electromagnetic field, pulse modulated	900±5 10 50 200	MHz V/m (unmodulated, r.m.s) Duty cycle % Rep. frequency Hz	ENV 50204	JIS C 61000-4-3	Spot frequency within the indicated range	A
Electrostatic discharge	4 (contact) 8 (air discharge)	kV (charge potential)	JIS C 61000-4-2	JIS C 61000-4-2	See basic standard for applicability of contact and/or air discharge test	B
Note Except for the ITU broadcast frequency bands: 87 MHz – 108 MHz, 174 MHz – 230 MHz and 470 MHz – 790 MHz, where the level shall be 3 V/m.						

Table AA.3 Immunity – Ports for signal lines and data buses not involved in process control, etc.

Environmental phenomena	Test specification	Units	Basic standard	Test set-up	Remarks	Performance criteria
Radio-frequency common mode. Amplitude modulated	0.15 – 80 10 80 150	MHz V (r.m.s unmodulated) % AM (1 kHz) Source impedance (Ω)	JIS C 61000-4-6	JIS C 61000-4-6	See Note 1, 2 and 3. The test level specified is prior to modulation.	A
Fast transients	1 5/50 5	kV (peak) Tr/Th ns Rep. Frequency kHz	JIS C 61000-4-4	JIS C 61000-4-4 (capacitive clamp)	See Note 3	B
Notes 1 The test level can be defined as the equivalent current into a 150 Ω load. 2 Except for the ITU broadcast frequency band: 47 MHz – 68 MHz, where the level shall be 3 V. 3 Applicable only to ports interfacing with cables whose total length according to the manufacturer's functional specification may exceed 3 m.						

Table AA.4 Immunity—Ports for process, measurement and control lines and long bus and control lines

Environmental phenomena	Test specification	Units	Basic standard	Test set-up	Remarks	Performance criteria
Radio-frequency common mode. Amplitude modulated	0.15–80 10 80 150	MHz V (r.m.s. unmodulated) % AM (1 kHz) Source impedance (Ω)	JIS C 61000-4-6	JIS C 61000-4-6	See Note 1 and 2. The test level specified is prior to modulation.	A
Fast transients	2 5/50 5	kV (peak) Tr/Th ns Rep. Frequency kHz	JIS C 61000-4-4	JIS C 61000-4-4 (capacitive clamp)		B
Notes 1 The test level can be defined as the equivalent current into a 150 Ω load. 2 Except for the ITU broadcast frequency band: 47 MHz–68 MHz, where the level shall be 3 V.						

Table AA.5 Immunity—DC input and DC output power ports

Environmental phenomena	Test specification	Units	Basic standard	Test set-up	Remarks	Performance criteria
Radio-frequency common mode. Amplitude modulated	0.15–80 10 80 150	MHz V (r.m.s. unmodulated) % AM (1 kHz) Source impedance (Ω)	JIS C 61000-4-6	JIS C 61000-4-6	See Note 1 and 2. The test level specified is prior to modulation.	A
Fast transients	2 5/50 5	kV (peak) Tr/Th ns Rep. Frequency kHz	JIS C 61000-4-4	JIS C 61000-4-4 (direct injection)	See Note 3	B
Notes 1 The test level can be defined as the equivalent current into a 150 Ω load. 2 Except for the ITU broadcast frequency band: 47 MHz–68 MHz, where the level shall be 3 V. 3 Not Applicable to input ports intended for connection to a battery or to a rechargeable battery which shall be removed or disconnected from the apparatus for recharging.						

Table AA.6 Immunity—AC input and AC output power ports

Environmental phenomena	Test specification	Units	Basic standard	Test set-up	Remarks	Performance criteria
Radio-frequency common mode. Amplitude modulated	0.15–80 10 80 150	MHz V (r.m.s. unmodulated) % AM (1 kHz) Source impedance (Ω)	JIS C 61000-4-6	JIS C 61000-4-6	See Note 1 and 2. The test level specified is prior to modulation.	A
Fast transients	2 5/50 5	kV (peak) Tr/Th ns Rep. Frequency kHz	JIS C 61000-4-4	JIS C 61000-4-4 (direct injection)		B
Notes 1 The test level can be defined as the equivalent current into a 150 Ω load. 2 Except for the ITU broadcast frequency band: 47 MHz–68 MHz, where the level shall be 3 V.						

Table AA.7 Immunity—Earth ports

Environmental phenomena	Test specification	Units	Basic standard	Test set-up	Remarks	Performance criteria
Radio-frequency common mode. Amplitude modulated	0.15–80 10 80 150	MHz V (r.m.s. unmodulated) % AM (1 kHz) Source impedance (Ω)	JIS C 61000-4-6	JIS C 61000-4-6	See Note 1 and 2. The test level specified is prior to modulation.	A
Notes 1 The test level can be defined as the equivalent current into a 150 Ω load. 2 Except for the ITU broadcast frequency band: 47 MHz–68 MHz, where the level shall be 3 V.						

Annex BB (informative) Bibliography

This annex supplements the text and annex AA (normative), and does not part of the provisions.

JIS C 9335-2-28 *Safety of household and similar electrical appliances—Part 2-28: Particular requirements for sewing machines*

Note : IEC 60335-2-28, *Safety of household and similar electrical appliances—Part 2: Particular requirements for sewing machines* is equivalent to the said standard including some items.

Annex 1 (informative) Comparison table of related standards

This annex (informative) is to supplement the matters related to the text and not to constitute the provision of this Standard.

This table shows the extent of coincidence of contents of JIS B 9960-1 (IEC 60204-1:1997), IEC 60204-1:1992 and this Standard, JIS B 9960-31.

Note : Symbols in this table indicate as follows:

○ : 99 % or over coincident

□ : 80 % or over coincident

△ : 50 % or over coincident

× : 50 % or over different

Middle column shows extent of coincidence between IEC 60204-1:1992 and JIS B 9960-1:1999 in left column.

Some of item No. in IEC 60204-1:1997 (JIS B 9960-1) differ from those in IEC 60204-1:1992.

For example, Chapters 11, 12, 13, 14, 15, 16, 17, 18, and 19 of 1997 editions are correspond to chapter 12, 13, 14, 15, 16, 17, 18, 19 and 20 of 1992 edition respectively.

Right column shows extent of coincidence between this Standard and IEC 60204-1992.

Items with symbol ×, △ or □ in the right column show that those apply with modifying IEC 60204-1:1992, and the content of modification is described in the text of this Standard. Items with symbol ○ are those identical in provision with IEC 60204-1992.

Items with ○ in both right and middle columns are those identical in provision of this Standard and IEC 60204-1:1997, and so the contents of provision can be known from corresponding items of JIS B 9960-1.

JIS B 9960-1:1999 (IEC 60204-1:1997)		IEC 60204-1:1992 (Shows extent of coincidence with IEC 60204-1:1997)		JIS B 9960-31 (IEC 60204-31) (Shows extent of coincidence with IEC 60204-1:1992)
section No.	Title of section	section No.	Extent of coincidence with left column	Extent of coincidence with middle column
Title	Safety of machinery – Electrical equipment of machines – Part 1: General requirements	Title	Electrical equipment of industrial machines – Part 1: General requirements	Safety of machinery – Electrical equipment of machines – Part 31: Particular safety and EMC requirements for sewing machines, units and systems
	Scope	1	<input type="checkbox"/>	× Replacement of all contents
2	Normative references	2	<input type="checkbox"/>	△ Addition of normative references
3	Definitions	3	<input type="checkbox"/>	△ Addition of definition item
4	General requirements (Title only)	4	○	○
4.1	General considerations	4.1	<input type="checkbox"/>	○
4.2	Selection of equipment	4.2	○	○
4.3	Electrical supply (Title only)	4.3	△ Title + contents	○
4.3.1	General			○
4.3.2	AC supplies	4.3.1	○	○
4.3.3	DC supplies	4.3.2	○	○
4.3.4	On-board power supply	—		
4.4	Physical environment and operating conditions (Title only)	4.4	<input type="checkbox"/> Title + contents	○
4.4.1	General			
4.4.2	Electromagnetic compati- bility (EMC)	4.4.1	△	× Detailed in annex AA
4.4.3	Ambient air temperature	4.4.2	△	○
4.4.4	Humidity	4.4.3	△	<input type="checkbox"/> Class 3K3 applies
4.4.5	Altitude	4.4.4	○	○
4.4.6	Contaminants	4.4.5	<input type="checkbox"/>	○
4.4.7	Ionizing and non-ionizing radiation	4.4.6	○	○
4.4.8	Vibration, shock, and bump	4.4.7	○	○
4.5	Transportation and storage	4.5	○	○
4.6	Provisions for handling	4.6	○	○
4.7	Installation and operation	4.7	○	○
5	Incoming supply conduc- tor terminations and devices for disconnecting and switching off	5	○	○
5.1	Incoming supply conduc- tor terminations	5.1	<input type="checkbox"/>	<input type="checkbox"/> Limited to only one incoming supply conductor termination.
5.2	Terminal for connection to the external protective earthing system	5.2	<input type="checkbox"/>	○
5.3	Supply disconnecting (isolating) device	5.3	○	○
5.3.1	General	5.3.1	<input type="checkbox"/>	<input type="checkbox"/> Limited to only one supply disconnecting devise.
5.3.2	Type	5.3.2	<input type="checkbox"/>	<input type="checkbox"/> Additional requirement in d)

JIS B 9960-1:1999 (IEC 60204-1:1997)		IEC 60204-1:1992 (Shows extent of coincidence with IEC 60204-1:1997)		JIS B 9960-31 (IEC 60204-31) (Shows extent of coincidence with IEC 60204-1:1992)
5.3.3	Requirements	5.3.3	○ Requirement	
		5.3.3.1	○ General	□ Addition of interpretation
—	—	5.3.3.2	× Power operated circuit-breakers	○
5.3.4	Operating handle	5.3.4	○	□ Specification of height of handle
5.3.5	Excepted circuits	5.3.5	○	○
5.4	Devices for switching off for prevention of unex- pected start-up	5.4	□	○
5.5	Devices for disconnecting electrical equipment	—		
5.6	Protection against unau- thorized, inadvertent and/or mistaken connection			
6	Protection against electric shock	6	○	○
6.1	General	6.1	○	□ Addition of interpretation
6.2	Protection against direct contact	6.2	□ Title+contents	○
6.2.1	General			
6.2.2	Protection by enclosures	6.2.1	□	○
6.2.3	Protection by insulation of live parts	6.2.2	○	○
6.2.4	Protection against resid- ual voltages	6.2.3		○
6.2.5	Protection by barriers	—		
6.2.6	Protection by placing out of reach or protection by obstacles			
6.3	Protection against indirect contact (Title only)	6.3	△ Protection by the use of PELV (title+contents)	○
6.3.1	General			
6.3.2	Measures to prevent the occurrence of a hazardous touch voltage	—		
6.3.2.1	General			
6.3.2.2	Protection by use of class II equipment or by equivalent insulation	6.3.2	○	○
6.3.2.3	Protection by electrical separation	6.3.3	○	○
6.3.2.4	Supply system design	—		
6.3.3	Protection by automatic disconnection of supply	6.3.1 provisions	□	○
6.4	Protection by the use of PELV	6.4	△	□ Exclusion of application of b)
6.4.1	General requirements			
6.4.2	Sources for PELV	—		
7	Protection of equipment	7	○	○
7.1	General	7.1	□	○
7.2	Overcurrent protection	7.2	○ Title+contents	
7.2.1	General			
7.2.2	Supply conductors	7.2.1	○	○
7.2.3	Power circuits	7.2.2	□	○

JIS B 9960-1:1999 (IEC 60204-1:1997)		IEC 60204-1:1992 (Shows extent of coincidence with IEC 60204-1:1997)		JIS B 9960-31 (IEC 60204-31) (Shows extent of coincidence with IEC 60204-1:1992)
7.2.4	Control circuits	7.2.3	<input type="radio"/>	<input type="radio"/>
7.2.5	Socket outlets and their associated conductors	7.2.4	<input type="radio"/>	<input type="radio"/>
7.2.6	Lighting circuits	7.2.5	<input type="radio"/> Local lighting circuits	<input type="radio"/>
7.2.7	Transformers	7.2.6	<input type="radio"/>	<input type="radio"/>
7.2.8	Location of overcurrent protective devices	7.2.7	<input type="radio"/>	<input type="radio"/>
7.2.9	Overcurrent protective devices	7.2.8	<input type="checkbox"/>	<input type="radio"/>
7.2.10	Rating and setting of overcurrent protective devices	7.2.9	<input type="radio"/>	<input type="radio"/>
7.3	Overload protection of motors	7.3	<input type="radio"/>	<input type="radio"/>
7.4	Abnormal temperature protection	7.4	<input type="radio"/>	<input type="radio"/>
7.5	Protection against supply interruption or voltage reduction and subsequent restoration	7.5	<input type="checkbox"/>	<input type="checkbox"/> Easing of application by hold-to-run control device
7.6	Motor overspeed protection	7.6	<input type="checkbox"/>	<input type="radio"/>
7.7	Earth fault/residual current protection	—		
7.8	Phase sequence protection			
7.9	Protection against over- voltages due to lightning and to switching surges			
8	Equipotential bonding	8		
8.1	General	8.1	<input type="radio"/>	<input type="radio"/>
8.2	Protective bonding circuit	8.2	<input type="radio"/>	<input type="radio"/>
8.2.1	General	8.2.1	<input type="checkbox"/>	<input type="radio"/>
8.2.2	Protective conductors	8.2.2	<input type="radio"/>	<input type="radio"/>
8.2.3	Continuity of the protective bonding circuit	8.2.3	<input type="checkbox"/>	<input type="radio"/>
8.2.4	Exclusion of switching devices from the protective bonding circuit	8.2.4	<input type="radio"/>	<input type="radio"/>
8.2.5	Parts that need not be connected to the protective bonding circuit	8.2.5	<input type="radio"/>	<input type="checkbox"/> Addition of object for easing
8.2.6	Interruption of the protective bonding circuit	8.2.6	<input type="radio"/>	<input type="radio"/>
8.2.7	Protective conductor connecting points	8.2.7	<input type="radio"/>	<input type="radio"/>
8.3	Bonding for operational purposes	8.3	<input type="radio"/> Title + contents	<input type="radio"/>
8.3.1	General	—		
8.3.2	Bonding to the protective circuit			
—		8.4	Insulation failures	<input type="radio"/>
8.3.3	Bonding to a common reference potential	8.5	<input type="checkbox"/> Bonding to a common reference potential	<input type="radio"/>
		8.6	Electrical interference	<input type="radio"/>

JIS B 9960-1:1999 (IEC 60204-1:1997)		IEC 60204-1:1992 (Shows extent of coincidence with IEC 60204-1:1997)		JIS B 9960-31 (IEC 60204-31) (Shows extent of coincidence with IEC 60204-1:1992)
9	Control circuits and control functions	9	○	○
9.1	Control circuits	9.1	○	○
9.1.1	Control circuit supply	9.1.1	○	× Replacement
9.1.2	Control circuit voltages	9.1.2	○	○
9.1.3	Protection	9.1.3	○	○
9.1.4	Connection of control devices	9.1.4	○	□ Alteration
9.2	Control functions	9.2	○	○
9.2.1	Start functions	9.2.1	○	○
9.2.2	Stop functions	9.2.2	○	○
9.2.3	Operating modes	9.2.3	□	○
9.2.4	Suspension of safeguarding	9.2.4	○	○
9.2.5	Operation	9.2.5	○	○
9.2.5.1	General	9.2.5.1	△	○
9.2.5.2	Start	9.2.5.2	□	□ Addition of exclusion of application
9.2.5.3	Stop	9.2.5.3	□	□ Addition of interpretation
9.2.5.4	Emergency operations (emergency stop, emergency switching off)	9.2.5.4	□ Emergency stop Described together	○
9.2.5.4.1	General			
9.2.5.4.2	Emergency stop			
9.2.5.4.3	Emergency switching off	—		
9.2.5.5	Monitoring of command actions	9.2.5.5	□	○
9.2.5.6	Hold-to-run controls	9.2.5.6	○	○
9.2.5.7	Two-hand control	9.2.5.7	○	○
9.2.5.8	Enabling device	—		
9.2.6	Combined start and stop controls	9.2.6	□	○
9.2.7	Cableless control	—		
9.2.7.1	General			
9.2.7.2	Control limitation			
9.2.7.3	Stop			
9.2.7.4	Serial data communication			
9.2.7.5	Use of more than one operator control station			
9.2.7.6	Battery-powered operator control stations			
9.3	Protective interlocks	9.3	○	○
9.3.1	Reclosing or resetting of an interlocking safeguard	9.3.1	□ Restoration of interlocked safeguards	○
9.3.2	Overtravel limits	9.3.2	○	
9.3.3	Operation of auxiliary functions	9.3.3	○	○
9.3.4	Interlocks between different operations and for contrary motions	9.3.4	□	○
9.3.5	Reverse current braking	9.3.5	○	○
9.4	Control functions in the event of failure	9.4	○	
9.4.1	General requirements	9.4.1	□	□ Addition of note
9.4.2	Measures to minimize risk in the event of failure	9.4.2	○	○

JIS B 9960-1:1999 (IEC 60204-1:1997)		IEC 60204-1:1992 (Shows extent of coincidence with IEC 60204-1:1997)		JIS B 9960-31 (IEC 60204-31) (Shows extent of coincidence with IEC 60204-1:1992)
9.4.2.1	Use of proven circuit techniques and components	9.4.2.1	○	<input type="checkbox"/> Alteration
9.4.2.2	Provisions for redundancy	9.4.2.2	○	<input type="checkbox"/> Addition of easing condition
9.4.2.3	Use of diversity	9.4.2.3	○	<input type="checkbox"/> Addition of easing condition
9.4.2.4	Functional tests	9.4.2.4	○	○
9.4.3	Protection against maloperation due to earth faults, voltage interruptions and loss of circuit continuity	9.4.3	△ Protection against maloperations due to earth faults and voltage interruptions	○
9.4.3.1	Earth faults	9.4.3.1	<input type="checkbox"/>	<input type="checkbox"/> Addition of substitution measures
9.4.3.2	Voltage interruptions	9.4.3.2	○	○
9.4.3.3	Loss of circuit continuity	—		
10	Operator interface and machine-mounted control devices	10	○	○
10.1	General	10.1	○ Described together	
10.1.1	General device requirements			
10.1.2	Location and mounting	10.1.1	○	<input type="checkbox"/> Replacement
10.1.3	Protection	10.1.2	<input type="checkbox"/>	<input type="checkbox"/> Replacement
10.1.4	Position sensors	10.1.3	<input type="checkbox"/>	○
10.1.5	Portable and pendant control stations	—		
10.2	Push-buttons	10.2	○	○
10.2.1	Colours	10.2.1	△	<input type="checkbox"/> Alteration
10.2.2	Markings	10.2.2	○	○
10.3	Indicator lights and displays	10.3	○	○
10.3.1	Modes of use	10.3.1	○	○
10.3.2	Colours	10.3.2	○	<input type="checkbox"/> Alteration
10.3.3	Flashing lights	10.3.3	○	○
10.4	Illuminated push-buttons	10.4	○	<input type="checkbox"/> Alteration
10.5	Rotary control devices	10.5	○	○
10.6	Start devices	10.6	○	○
10.7	Devices for emergency stop	10.7	○	○
10.7.1	Location	10.7.1	<input type="checkbox"/> General (containing requirements for location)	○
10.7.2	Types	10.7.2	<input type="checkbox"/>	○
10.7.3	Restoration of normal function after emergency stop	10.7.3	<input type="checkbox"/> Characteristics (contents are the same but titles are different)	○
10.7.4	Actuators	10.7.4	○	○
10.7.5	Local operation of the supply disconnecting device to effect emergency stop	10.7.5	× Use of means of disconnection	△ Addition

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10.8	Devices for emergency switching off	—		
10.8.1	Location			
10.8.2	Types			
10.8.3	Restoration of normal function after emergency switching off			
10.8.4	Actuators			
10.8.5	Local operation of the supply disconnecting device to effect emergency switching off			
10.9	Displays	10.8	○	○
—		11	Control interfaces	
		11.1	General	△ Addition
		11.2	Digital input/output interfaces	○
		11.2.1	Inputs	○
		11.2.2	Outputs	△ Exclusion of application of first phrase
		11.3	Drive interfaces with analogue inputs	○
		11.3.1	Separation between control and electric drives	○
		11.3.2	Hydraulic servo-valves	○
		11.3.3	Electric servo and velocity drives	○
		11.4	Peripherals	○
		11.5	Communications	○
11	Electronic equipment	12	○	○
11.1	General	12.1	○	○
11.2	Basic requirements	12.2	○	○
11.2.1	Inputs and outputs	12.2.1	○	○
—		12.2.2	Electronic control equipment	○
11.2.2	Equipotential bonding	12.2.3	○	○
11.3	Programmable equipment	12.3	○	○
11.3.1	Programmable controllers	12.3.1	○	○
11.3.2	Memory retention and protection	12.3.2	○	○
—		12.3.3	Programmable equipment	○
11.3.3	Software verification	12.3.4	○	○
11.3.4	Use in safety-related functions	12.3.5	○	○
12	Controlgear: location, mounting, and enclosures	13	○	○
12.1	General requirements	13.1	□	○
12.2	Location and mounting	13.2	○	○
12.2.1	Accessibility and maintenance	13.2.1	○	□ Specifies mounting height

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12.2.2	Physical separation or grouping	13.2.2	<input type="checkbox"/> Segregation	△ Addition
12.2.3	Heating effects	13.2.3	○	○
12.3	Degrees of protection	13.3	△	△ Replacement
12.4	Enclosures, doors and openings	13.4	<input type="checkbox"/>	○
12.5	Access to controlgear	—		
13	Conductors and cables	14	○	○
13.1	General requirements	14.1	<input type="checkbox"/>	○
13.2	Conductors	14.2	○	○
13.3	Insulation	14.3	○	○
13.4	Current-carrying capacity in normal service	14.4	○	○
13.5	Conductor and cable voltage drop	14.5	○ Voltage drop (only title is different)	○
13.6	Minimum cross-sectional area	14.6	○	○
13.7	Flexible cables	—		
13.7.1	General			
13.7.2	Mechanical rating			
13.7.3	Current-carrying capacity of cables wound on drums			
13.8	Collector wires, collector bars and slip-ring assemblies			
13.8.1	Protection against direct contact			
13.8.2	Protective conductor circuit			
13.8.3	Protective conductor current collectors			
13.8.4	Removable current collectors with a disconnecter function			
13.8.5	Clearances in air			
13.8.6	Creepage distances			
13.8.7	Conductor system sectioning			
13.8.8	Construction and installation of collector wire, collector bar systems and slip-ring assemblies			
14	Wiring practices	15	○	○
14.1	Connections and routing	15.1	○	○
14.1.1	General requirements	15.1.1	○	○
14.1.2	Conductor and cable runs	15.1.2	○	○
14.1.3	Conductors of different circuits	15.1.3	<input type="checkbox"/>	○
14.2	Identification of conductors	15.2	○	○
14.2.1	General requirements	15.2.1	○	○
14.2.2	Identification of the protective conductor	15.2.2	○	○
14.2.3	Identification of the neutral conductor	15.2.2	<input type="checkbox"/>	○
14.2.4	Identification of other conductors	15.2.4	○	<input type="checkbox"/> Addition
14.3	Wiring inside enclosures	15.3	○	○
14.4	Wiring outside enclosures	15.4	○	○

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14.4.1	General requirements	15.4.1	○	○
14.4.2	External ducts	15.4.2	○	○
14.4.3	Connection to moving elements of the machine		×	○
14.4.4	Interconnection of devices on the machine		○	○
14.4.5	Plug/socket combinations	15.4.5	□	○
14.4.6	Dismantling for shipment	15.4.6	□	○
14.4.7	Additional conductors	15.4.7	○	○
14.5	Ducts, connection boxes and other boxes	15.5	△ Ducts, connection and junction boxes (titles are different)	○
14.5.1	General requirements	15.5.1	□	○
14.5.2	Percentage fill of ducts	15.5.2	○	○
14.5.3	Rigid metal conduit and fittings	15.5.3	○	○
14.5.4	Flexible metal conduit and fittings	15.5.4	○	○
14.5.5	Flexible non-metallic conduit and fittings	15.5.5	○	○
14.5.6	Cable trunking systems	15.5.6	○	○
14.5.7	Machine compartments and cable trunking systems	15.5.7	○	○
14.5.8	Connection boxes and other boxes	15.5.8	△ terminals, connection and junction boxes (both of title and contents are different)	△ Alteration
14.5.9	Motor connection boxes	15.5.9	○	○
15	Electric motors and associated equipment	16	○	○
15.1	General requirements	16.1	○	□ Addition
15.2	Motor enclosures	16.2	○	△ Addition
15.3	Motor dimensions	16.3	○	△ Addition
15.4	Motor mounting and compartments	16.4	○	○
—		16.5	Motor nameplates	○
15.5	Criteria for motor selection	16.6	○	○
15.6	Protective devices for me- chanical brakes	—		
16	Accessories and lighting	17	○	○
16.1	Accessories	17.1	□	○
16.2	Local lighting of the ma- chine and equipment	17.2	○	○
16.2.1	General	17.2.1	○	□ Addition
16.2.2	Supply	17.2.2	○	□ Addition
16.2.3	Protection	17.2.3	○	○
16.2.4	Fittings	17.2.4	○	○
17	Marking, warning signs and reference designations	18	□ Warning signs and item designations	○
17.1	General	18.1	□ Nameplates, markings and iden- tification (titles are different and con- tents are similar)	○

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17.2	Warning signs	18.2	△	○
17.3	Functional identification	18.3	○	○
17.4	Marking of control equipment	18.4	□	○
17.5	Reference designations	18.5	□ Item designations (titles are different, contents are similar)	○
18	Technical documentation	19	○	○
18.1	General	19.1	□	○
18.2	Information to be provided	19.2	○	○
18.3	Requirements applicable to all documentation	19.3	□	○
18.4	Basic information	19.4	○	○
18.5	Installation diagram	19.5	○	○
18.6	Block (system) diagrams and function diagrams	19.6	○	○
18.7	Circuit diagrams	19.7	○	○
18.8	Operating manual	19.8	○	□ Addition
18.9	Maintenance manual	19.9	○	○
18.10	Parts list	19.10	□	○
19	Testing and verification	20	△ Testing (titles are different)	○
19.1	General	20.1	□	□ Addition
19.2	Continuity of the protec- tive bonding circuit	20.2	□	○
19.3	Insulation resistance tests	20.3	□	△ Addition
19.4	Voltage tests	20.4	○	□ Addition
19.5	Protection against resid- ual voltages	20.5	○	○
—		20.6	Electromagnetic compatibility tests	× Replacement
19.6	Functional tests	20.7	○	○
19.7	Retesting	20.8	□	○
Annex A	Examples of machines covered by this part of JIS B 9960	Annex A	△	○
Annex B	Inquiry form for the electrical equipment of machines	Annex B	□	○
Annex C	Current-carrying capacity and overcurrent protec- tion of conductors and cables in the electrical equipment of machines	Annex C	○	○
Annex D	Explanation of emergency operation functions	Annex D	× Comparison of conductor cross-sec- tional areas (titles are different, con- tents are different)	○
Annex E	Bibliography	—		
—		—		Annexes AA: Electromagnetic compatibility requirements
—		—		Annexes BB: Bibliography

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Errata will be provided upon request, please contact:
Standardization Promotion Department, Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN
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